halos, with four mock moons, presenting a display of remarkable brilliancy and great perfection, were observed between 9 and 10 p. m. on the night of the 14th in central Coloroado, the stations of Pike's Peak, Denver and Colorado Springs having opportunity for complete observations. From Denver two paraselenæ were observed at points where the parhelic circle cut the halo of 22° radius and two where the intersection would have taken place if there had been present a halo of 90° radius; at a point about 85° above the horizon there appeared a brilliant inverted rainbow arch in the position where a halo of 46° radius would have passed.

MISCELLANEOUS PHENOMENA.

Earthquakes.—Salinas City., Cal., 2nd, (no time given,) motion from north to south; pendant bodies freely vibrated. Visalia, Cal., 1st, 4:11 p. m., three shocks in rapid succession, lasting altogether about two seconds; motion southeast to northwest; 9:53 p. m., another rapid succession of shocks, two in number, and continuing for about two seconds; vibrating motion from south east to northwest; force displayed less severe than former.

Meteors.—Mt. St. Helena, Cal., 11th, 7:30 p. m., very brilliant; course NE. to SW.; upon exploding produced a loud report, which was experienced for several miles around. San Francisco, 2nd, 9:45 p. m., very large and brilliant; passed over city to the northeast; color pale green. Deadwood, 19th, 11 p. m., very brilliant; course SE. to NW.; 27th, 11 p. m., course E. to W.; exploded with fragments like a rocket.

Sunsets.—The characteristics of the sky at sunset as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service Stations. Reports from 174 stations show 4,846 observations to have been made, of which 22 were reported doubtful; of the remainder, 4,097 or 84.9 per cent. were followed by the expected weather.

Sun Spots.—The following record of observations, made by Mr. D. P. Todd, Assistant, has been forwarded by Prof. S Newcomb, U. S. Navy, Superintendent Nautical Almanac Office, Washington, D. C.:

DATE—Feb., 1881.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		REMARKS.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots.	
2, 10 a. m.	0	5	0	10	0	5	5	35†	
3, 9 a. m.	0	0	0	10	0	0	4	25†	
4, 9 m.	0	0	0	10	0	10	4	25†	Faculæ.
5, 9 a. m.	0	5	2	5	0	5	2	25†	Faculæ.
6, 10 a. m.	2	15	0	0	1	4	4	40†	Faculæ.
7, 1 p. m.	0	0	0	0	0	0	4	40†	
10, 3 p. m.	0	0	1	20†	0	0	3	15†	Spots probably disappeared by solar rotation.
11, 8 a. m.	1	3	0	3	0	0	4	15	Faculæ.
12, 10 a. m.	0	0	1	5	0	0	3	10	
13, 9 a. m.	0	0	0	0	0	0	3	10	Faculæ.
14, 9 a. m.	2	4	1	2	2	4	4	12	Faculæ.
15, 9 a. m.	2	5	0	0	0	0	6	17†	Faculæ.
16, 8 a. m.	0	5	0	0	0	0	6	20†	Broad areas of faculæ.
4 p. m.	0	0	0	0	0	0	6	20†	Broad areas of faculæ.
17, 9 a. m.	1	5	0	0	0	0	6	25†	Faculæ. Two of the spots very large.
19, 4 p. m.	2	8	2	20†	2	8	6	13	Faculæ. Two of the spots very large.
20, 10 a. m.	1	10	1	1	0	0	6	22	Faculæ. Two of the spots very large.
2 p. m.	0	0	0	0	0	0	6	22	Faculæ. Two of the spots very large.
23, 8 a. m.	2	6	3	12	1	2	5	12	Faculæ. Spots probably disappeared by solar rotation.
25, 5 p. m.	0	0	0	0	0	0	5	10	
26, 9 a. m.	0	0	1	1	0	0	4	8	Faculæ.

† Approximated.

Mr. William Dawson, at Spiceland, Ind., reports: 2nd, three groups and about 25 spots; large spot at east edge and another at west edge. 13th, two large spots close together, midway between centre and west edge. 15th, six groups, 24 spots; faculæ at east side; air very good. 17th, six groups, 26 spots; large spot close to east edge. 19th, four groups, 9 spots; air poor; 21st, six groups, 23 spots, one large, 11 others quite prominent. 22nd, six groups, 45 spots; one very large spot alone in the SW. quadrant; best air for many weeks. 25th, five groups, 16 spots; new group and faculæ at east edge; faculæ at west edge; air middling good.

Mr. H. D. Gowey, at North Lewisburg, Ohio, reports: saw sunspots every day except on the 4th, 6th, 8th to 10th, 12th, 13th, 18th, 20th, 27th and 28th, when it was too cloudy for observation.

NOTES AND EXTRACTS.

[From the Popular Science Monthly, March, 1881.]

Climatology of Europe.—The climate of Western Europe is ameliorated by the warmth of the Gulf Stream in winter, and by the neighborhood of the ocean in summer. In Eastern Europe these modifying influences cease to be felt, and the climate gradually assumes a continental character, with greater differences of temperature, colder winters and warmer summers. The differences in the summer temperatures of the eastern and western regions are less marked than those in the winter temperatures, and amount at most to about 27°. For the greater part of the continent the

differance in the temperature of July is not more than about 18°. The mildest summers are felt in Ireland and Norway, and the hottest in Southeastern Europe. The difference is perceptible between places in corresponding latitudes in the southeast and southwest. Thus, Syracuse is 7° and Sebastopol is 5½° warmer in July than Lisbon and Oporto. A similar difference, but less in extent, appears in going eastward along the northern parallels. The differences in the winter temperatures of the several parts of the continent are much more marked than are those of the summer temperatures. The mildest winters are felt along the Mediterranean coast and in the Iberian Peninsular, where the mean temperature in January is from 16° to 19°. The next mildest are those of the western coast of France and the southern coast of England and Ireland. The winters of western Scotland and the Orkney and Faroe Islands are milder than those of Berlin and Milan; those of the Arctic coasts of Scandinavia than those of the Gulf of Bothnia, as is shown by the fact that the Arctic fiords of Norway, even as far as North Cape, are not frozen, while the Gulf of Bothnia is regularly frozen in winter. In Russia the January temperature diminishes as we go east, so that, while it is about 24° at Warsaw, it is reduced to 4° at Uralsk. The highest annual mean temperature, the mildest winters and the warmest summers, must be looked for where the land approaches the thirty fifth parallel, at the southern points of Spain, Sicily, and C ete. The highest known mean in Europe is at Catania, 65°, the temperature of January being there 51°, and that of August 81°. Gibraltar enjoys a warmer temperature in January, 54°, nearly corresponding with the temperature of Cairo. The January of Catania is like that of the end of April. the January of Gibraltar like that of the first half of May, in Berlin. These extreme southern points suffer, however, occasionally from frost and snow. Snow fell on the African coast in 1845 and 1850, and in the latter year a temperature below the freezing-point was observed as far south as the Sahara; and the Nile is said to have been frozen in the year 859. So it is safe to assume that no place in Europe is secure from snow and frost.

[From the American Journal of Science, February, 1881.]

Ocean Temperatures in the Arctic—Observations taken on the S. S. Gulnare, by O. T. Sherman.—The following observations were taken on the Arctic S. S. Gulnare, during the summer of 1880. A Miller-Cassella thermometer was employed; its scale errors, carefully obtained, have in each case been applied. The steamer, at the time of making the observations, lay becalmed. If we refer to the older maps we see that on some the warm waters which render the west coast of Greenland habitable are connected with the Arctic current which renders the east coast barren. On others the warm current is shown at once as a branch of the Gulf Stream. On the newer German maps the currents are shown overlapping in about latitude 61° N. The following table serves to give confirmation to this latter representation, and also indicates the limits and depth:

Table I.—Deep Sea Temperatures.

Depth in fathoms.	Lat. 60° 6′ N. Long. 58° 36′ W.	Lat. 57° 38′ N. Long. 59° 15′ W.
0	41°.9 F.	45°.0 F.
10	41°.8	.....
20	40°.0	.....
30	.....	45°.0
80	39°.0	40°.0
90	.....	39°.0
110	38°.8	.....
150	38°.2	40°.0
270	40°.8	.....
340	40°.8	.....

The sudden rise in temperature at the lowest depths naturally caused some surprise to the observer, and was therefore measured three times. These observations may also in part explain the bend in the curve representing the limit of ice.

Phenomena of some rarity in the surface temperatures and densities were also observed by us. When passing in front of a glacier outlet, or across the track of an ice pack, we suddenly entered a body of water much colder and fresher than that surrounding it. The ice in each case readily suggested an explanation. Our interest was more excited at the depth of the freshened water, for the engineer found indefinitely the same changes of density in the water he took into the boiler about ten feet below the surface. On one occasion we had to sink a thermometer ten fathoms before obtaining indications of a rise in temperature.

It is true that the outcropping of the Arctic current would give similar phenomena, but to one on the spot the change was always seen to be connected with the melting of the ice.

Table II.—August 4, 1880.

Position.	Hour.	Surface Temperature.	Density Hydrometer. Scale reading.	Remarks.
	5	44°.0	4°.0=1.027316	
	6	46°.0	4°.0=1.027383	
	7	46°.0	4°.0=1.027383	
	8	35°.5	2°.5=1.016492	A deep-sea Thermometer sunk 10 fath's. read 40°.0.
	9	36°.0	2°.8=1.018644	
	.....	.....	.....	
Cape Desolation: sighted abeam.	10	39°.5	3°.0=1.020064	
	11	36°.0	2°.8=1.018641	
	12	36°.0	3°.2=1.021521	
	1	37°.0	2°.8=1.018527	
	2	42°.0	2°.8=1.018652	
	3	42°.0	3°.0=1.020091	
	4	43°.0	3°.0=1.020107	
	AUGUST 5, 1880.			
	2	44°.0	3°.0=1.020122	
Latitude 61° 27′.	3	44°.0	3°.0=1.020122	
	4	36°.0	2°.5=1.016486	Opposite glacier about thirty miles off shore.
	5	37°.0	3°.0=1.020068	
	7	37°.8	2°.8=1.018508	
Lat. 63° N., long. 51°	AUGUST 6, 1880.			
	4	38°.0	4°.0=1.027246	
	5	37°.5	4°.0=1.027240	
	6	38°.0	4°.0=1.027246	

[From the Popular Science Monthly, March, 1881.]

The Ocean-Currents of Greenland and Iceland.—Captain N. Hoffmeyer, Director of the Royal

Danish Meteorological Institute at Copenhagen, has published a summary of the facts ascertained in the recent deep-sea explorations of the Danish schooner Fylla, Captain Jacobson, which help to explain why Iceland, lying nearly on the edge of the Arctic Circle, is not frozen like its neighbor Greenland. The first Norwegian Deep-Sea Expedition, under Professor Mohn, brought out the surprising fact that the bank on which the British Islands lie is connected by a submarine ridge, of at most three hundred fathoms below the surface of the water, with the Faroe Islands, and that these islands are similarly connected with the southeast coast of Iceland; further, it was discovered that over this bottom ridge separating the Atlantic water in its great deeps from the water of the Arctic Sea—at least in summer—a relatively warm mass of water was moving toward the northeast which fully prevented the cold bottom water of the Arctic Ocean from flowing into the North Atlantic basin. Since, however, the depths of the Atlantic are occupied with a bed of water only a few degrees above freezing-point, the cooling of which cannot be ascribed to circumstances of place and position, but must be caused by an inflow of polar waters, the facts ascertained by the Norwegian expedition that no such inflow takes place between Iceland and Europe, in the broadest passage between the two seas, has become of the greatest scientific importance. Attention was accordingly directed to the other passages between the two seas—the Denmark Straits between Greenland and Iceland, and Davis's Straits—concerning the features of which not enough was accurately known. The most that had been learned concerning them was the work of a few observers, chiefly Admiral Irminger, who, by comparing the annual reports of voyages between Greenland and Iceland, had found that the Atlantic water along the fifty-ninth parallel, between the Orkney Islands and 30° west, over an extent of about nine hundred nautical miles, had tolerably uniform and relatively high temperature on the surface with a superficial current to the north; that, further, in consequence of this current, the warm surface-water, at least in the summer, reached the south coast of Iceland essentially unchanged in temperature, and was directed thence toward the northwest and north into the Denmark Straits and along the west coast of Iceland; that, on the other hand, a cold stream filled with thick drift-ice flowed from the Polar Sea along the east coast of Greenland through the Denmark Straits to Cape Farewell, and was strong enough to reach over the northwest coast of Iceland and fill its fiords with ice. As an offset to this, the ice does not, even in winter, enter the great bays of the west coast of Iceland, and the fisheries are prosecuted in those waters through the whole year. North of Iceland the stream sets decidedly toward the east, and often brings with it Greenland ice, which blockades the whole coast for a longer or shorter time. Admiral Irminger believes that this stream is a branch of the great East Greenland ice-stream which has rebounded from the northwest coast of Iceland and been deflected to the east. Other investigators have reached conclusions agreeing with these. In order to determine the matters which were in question, the Danish Government, in 1877, provided the Fylla with the necessary apparatus and ordered Captain Jacobson to take soundings and measurements of temperature. He performed his work with much energy, against many difficulties, and discovered that the warm stream which had been mentioned as washing the west coast of Iceland has considerable depth, and that it is strong enough at the North Cape to pass around it in its continued progress along the north coast of the island. The meteorological observations in the Island of Grimsey have also shown that this warm stream affects the island in the same way in the winter and considerably moderates its climate. Nevertheless, in severe winters, the Greenland ice pushes far down and causes the warm current to be covered with its cold meltings; the season is protracted, and Iceland suffers a bad year with hardly any summer.

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